

# PARACETAMOL DRUG

Presented by:

Anusuya Sahoo

Department of Chemistry

Shailabala Women's (A) College, Cuttack

# CONTENTS

---

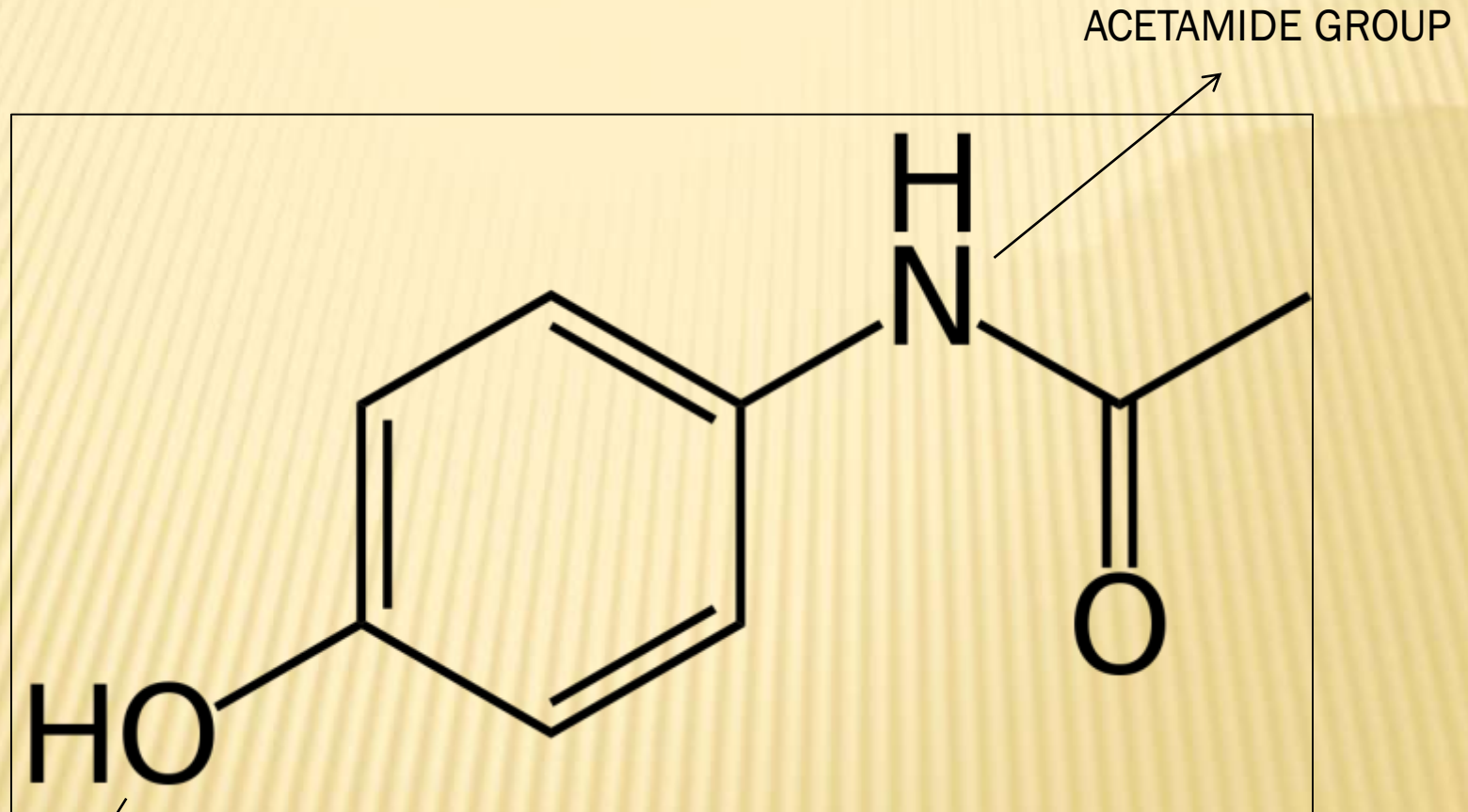
- **Introduction of Paracetamol**
- **Structure of Paracetamol**
- **Synthesis of Paracetamol**
- **Physical and chemical properties of paracetamol**
- **Uses of Paracetamol**
- **Dosage of Paracetamol**
- **Its works in the body**
- **Scientific diagram of absorption of paracetamol in the body**
- **Mechanism of action of paracetamol in the body**
- **Adverse effects of Paracetamol**

# INTRODUCTION

---

- ✘ It is known as Acetaminophen.
- ✘ It is used for the treatment of fever and pain.
- ✘ It is the WHO's list of essential medicines
- ✘ It is 25<sup>th</sup> commonly prescribed medicine which has been used all over the world since 2011.
- ✘ Many other trade names containing paracetamol composition are Panadol, Tylenol, DOLO-650, Jenamol-650 etc.

# STRUCTURE OF PARACETAMOL



Phenolic hydroxy group

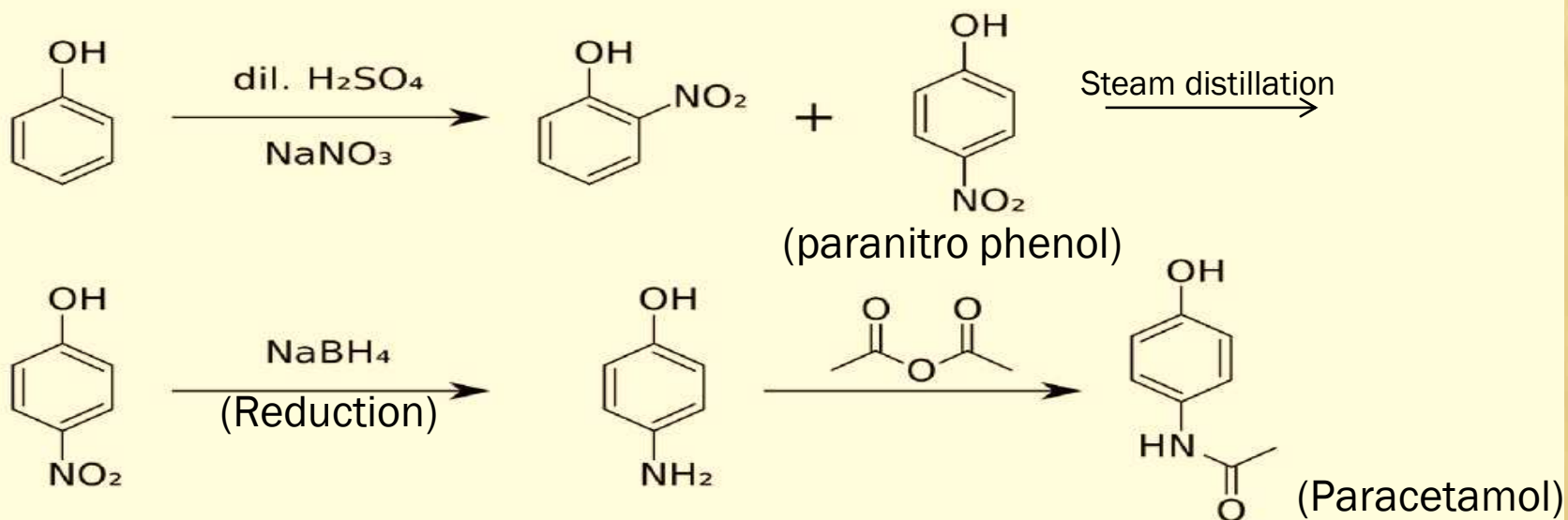
ACETAMIDE GROUP

# SYNTHESIS OF PARACETAMOL

## 1. Boot's Method:

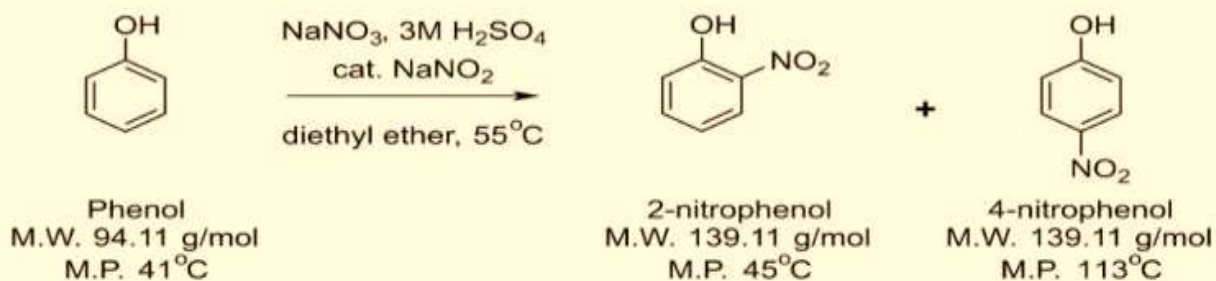
### Synthesis of Paracetamol

In the laboratory, **paracetamol** is easily prepared by **nitrating** phenol with **sodium nitrate**, separating the desired ***p*-nitro phenol** from the *ortho*- byproduct, and **reducing** the **nitro group** with **sodium boro hydride**. The resultant *p*-aminophenol is then **acetylated** with **acetic anhydride**. In this reaction, phenol is strongly activating, thus the reaction requires only mild conditions nitration. The industrial process is analogous, but **hydrogenation** is used instead of the **sodium boro hydride** reduction.

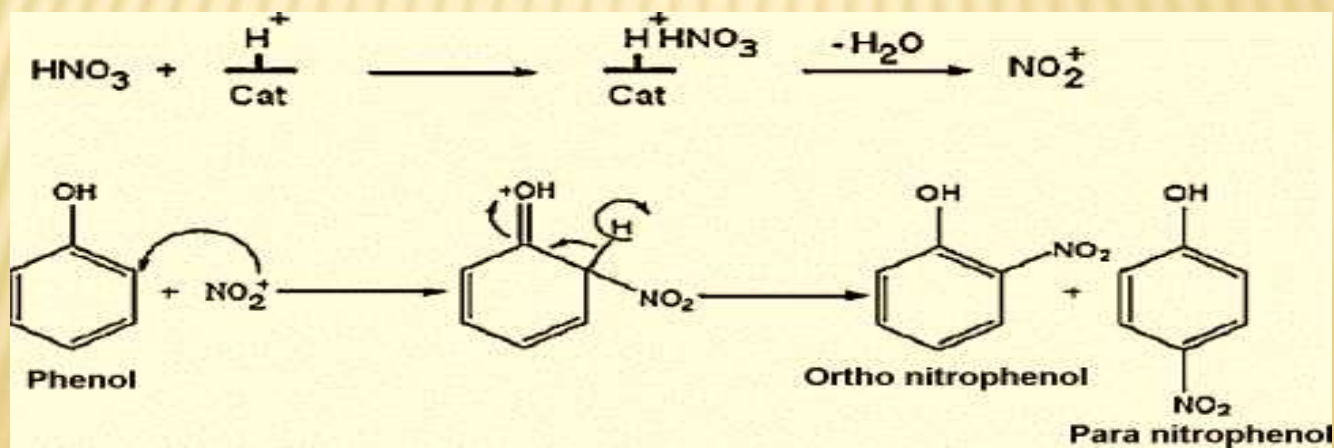


# MECHANISM FOR THE SYNTHESIS OF PARACETAMOL BY BOOT'S METHOD

Overall reaction for nitration of phenol:

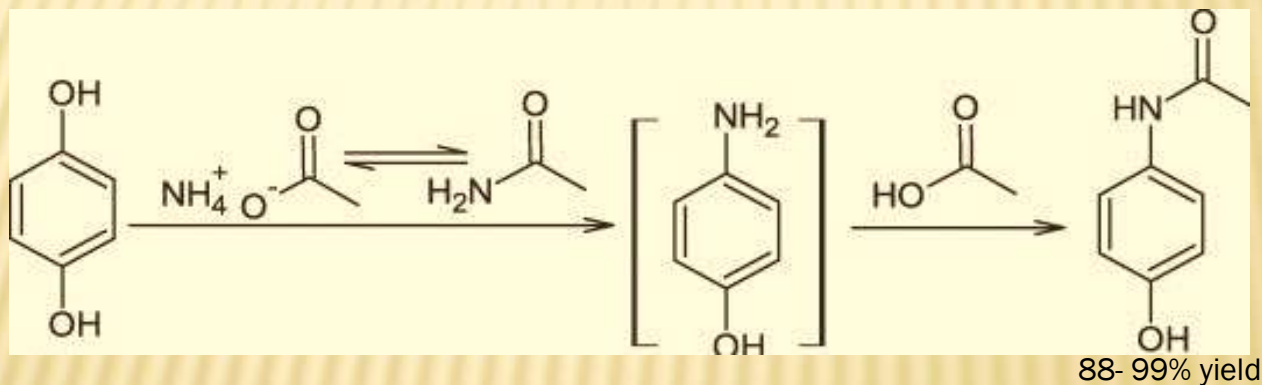
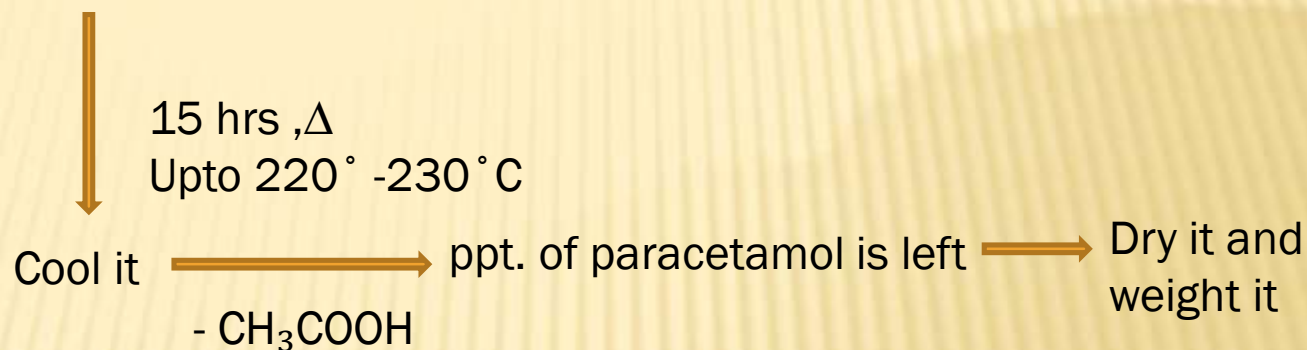


## Mechanism-



## 2.DIRECT SYNTHESIS / ONE POT SYNTHESIS:

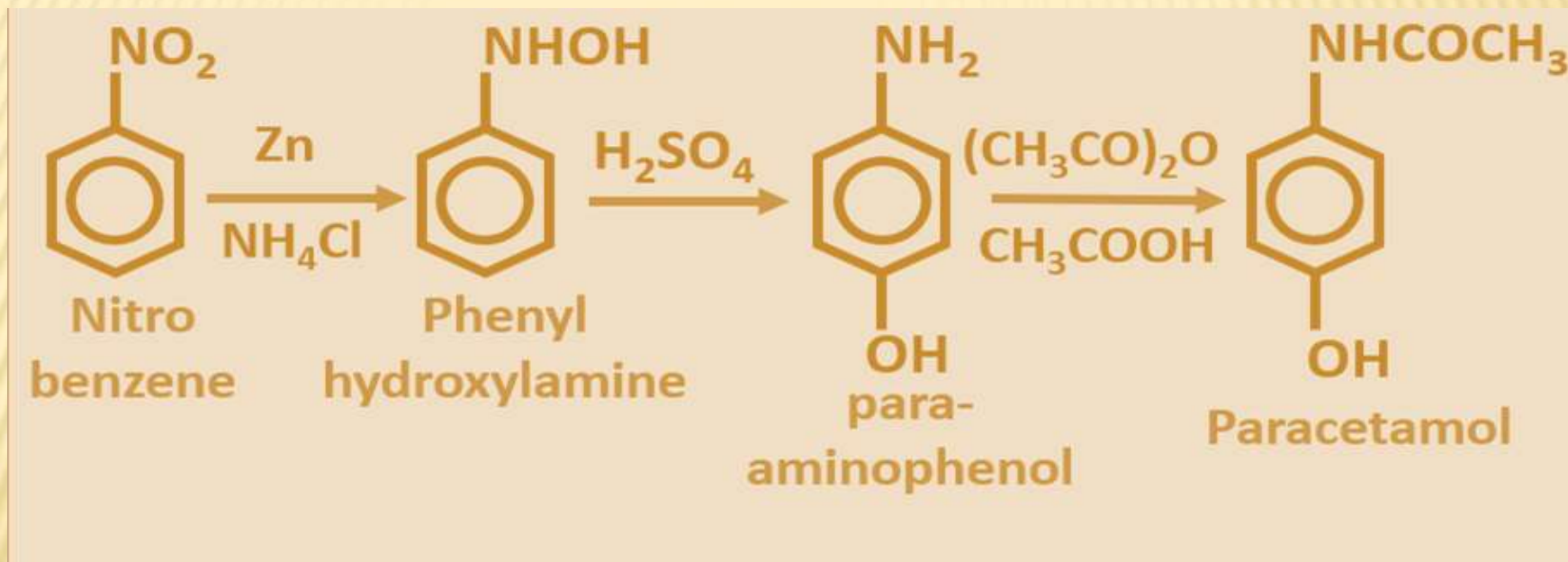
Hydroquinone + Ammonium acetate + Acetic acid



In this method we get pure paracetamol and its yield is 88-99% .

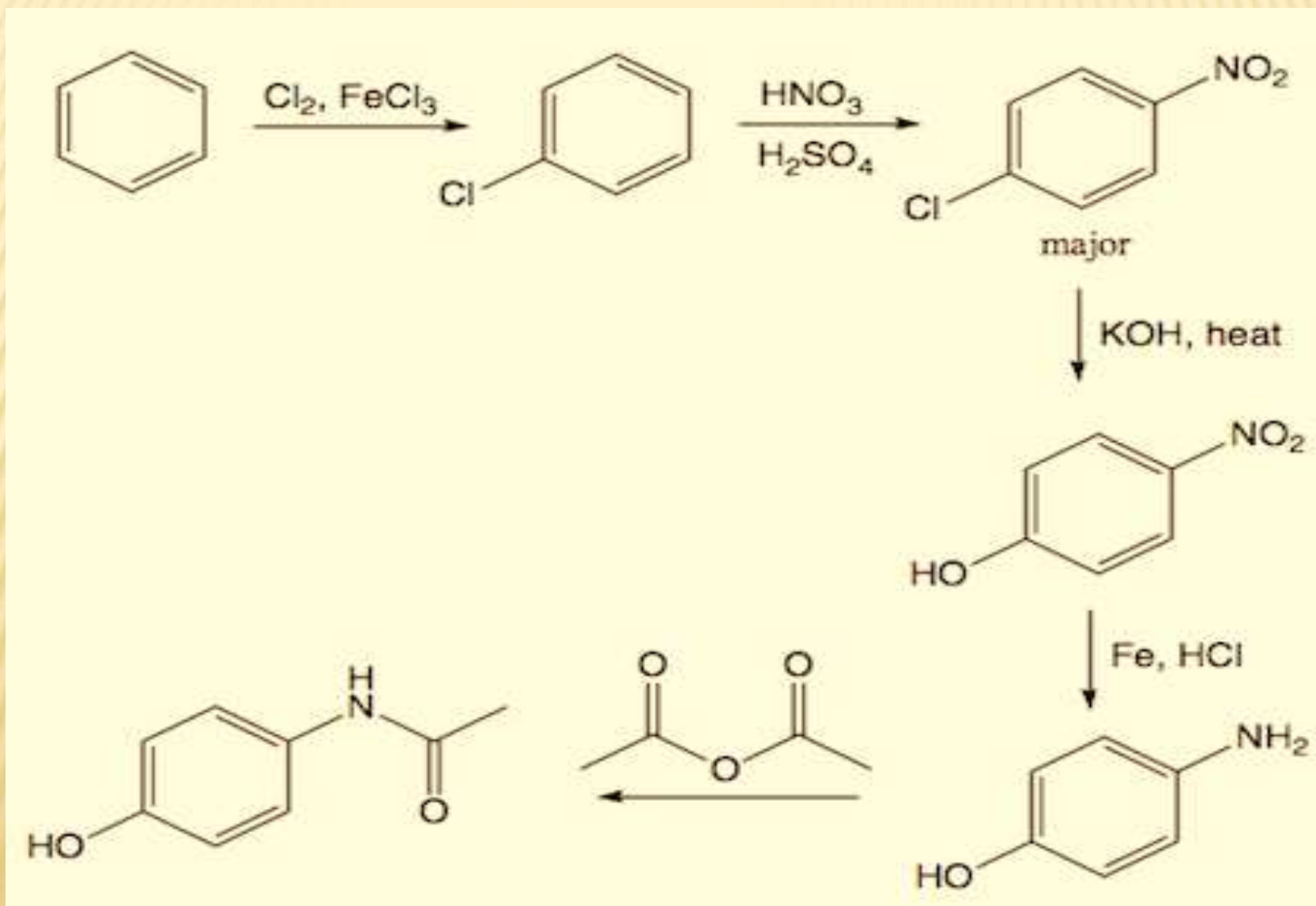
- This is due to
- Metal free reaction
- No harsh chemical used

### 3.Reduction of Nitrobenzene:





## 4) Nitration of Chlorobenzene



## **Physical properties of Paracetamol**

Acetaminophen or Paracetamol is a white crystalline solid with a density of 1.293 g/mL, molar mass of 151.165 g/mol, melting point of 168°C, and boiling point of 420°C. The molecule has planar geometry and two hydrogen bonds, and its 7 carbons have  $sp^2$  hybridization.

## **Chemical Properties of Paracetamol**

**Solubility:** Soluble in water, ethanol, acetone, chloroform, glycerol, methanol, propylene glycol and solutions of alkali hydroxides; insoluble in diethyl ether.

# USES OF PARACETAMOL

**1.Reduction of Pain(Analgesic):** It is used as analgesic .

It reduces pain of migraine, tension, headache, kidney stone pain, etc.

**2.Fever:** It is used as antipyretic e.g. it helps in reduction of fever of all ages persons, safe for babies also and for them dose depend on weight of baby.

**3.Osteoarthritis:** Arthritis pain of hip, hand and knee can be healed by paracetamol.

**4. Lower Back Ache:**

**5. Headache**

**6.Teeth pain**

**7.Combination Medicines** zerodol-p, zerodol-sp , solvin cold ,namcold

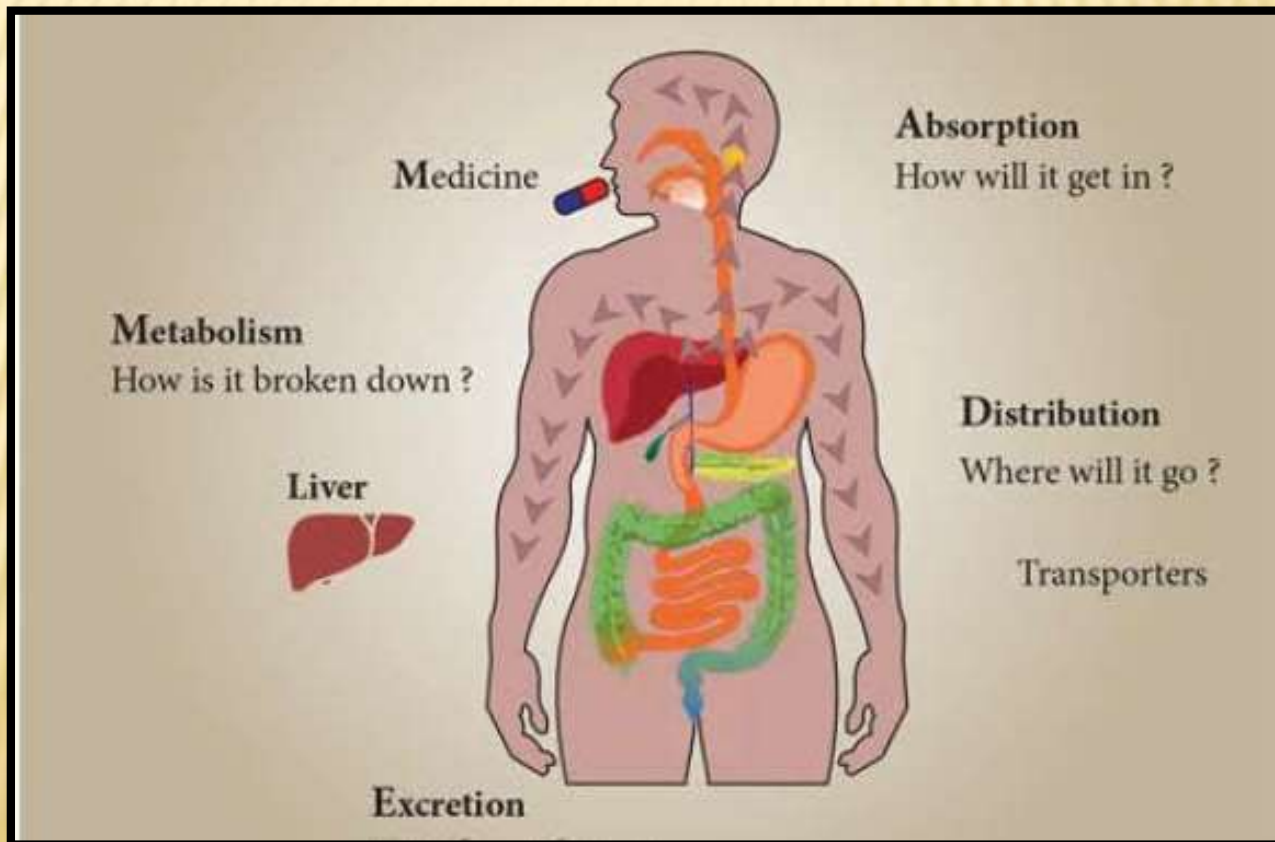
# DOSAGE OF PARACETAMOL -

Your child's weight	120mg per 5mL	250mg per 5mL
5kg or less	Ask doctor	Ask doctor
6.5kg	4mL	2mL
8kg	5mL	2.5mL
10kg	6mL	3mL
15kg	9mL	4.5mL
20kg	12mL	6mL
30kg	18mL	9mL
40kg	25mL	12mL

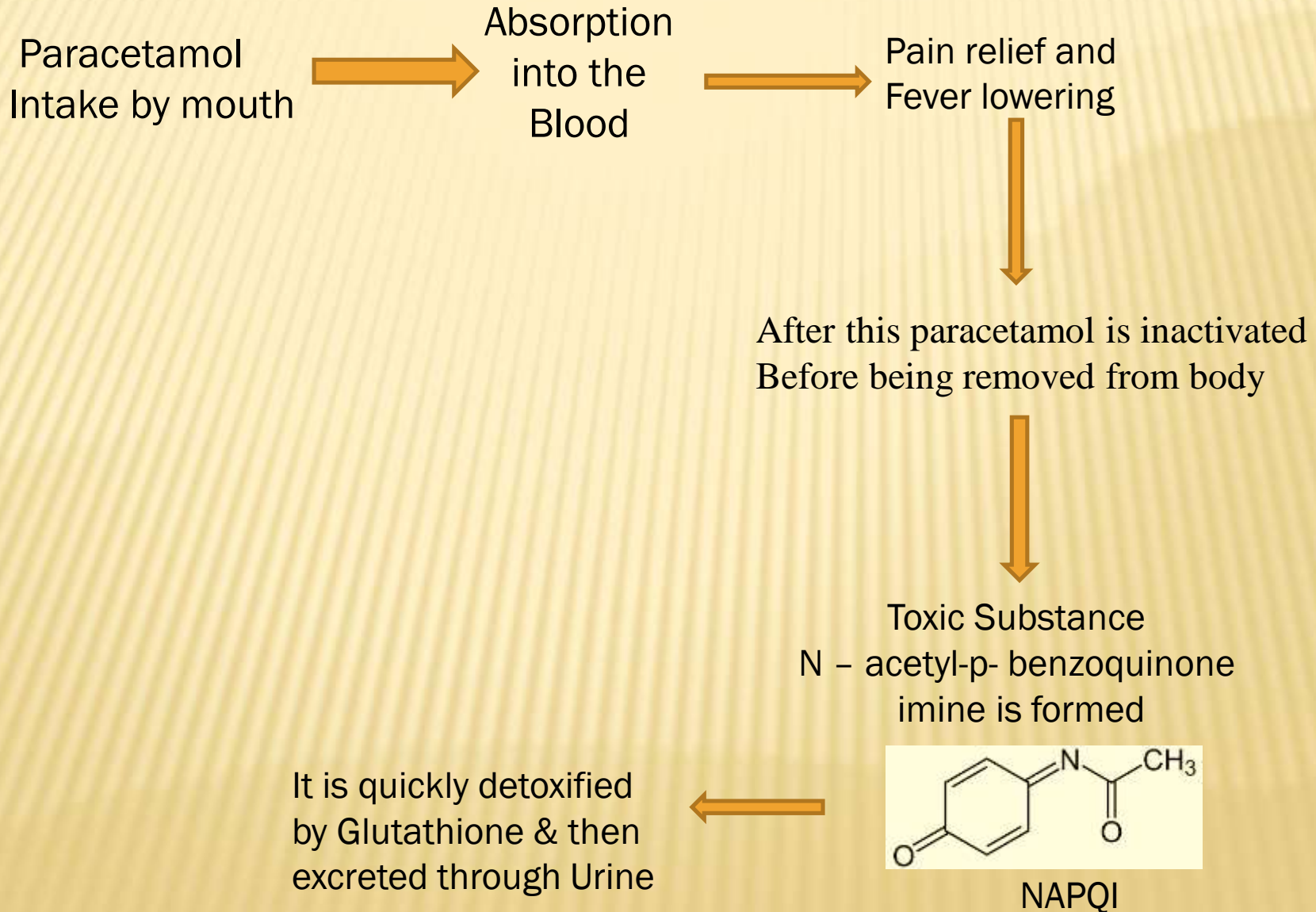
- This chart is used for child less than 12 years of age.
- Dosage of Paracetamol for adult is 325-650 mg in every 4-6 hrs as necessary.

# HOW DOES IT WORK IN THE BODY

- ✘ When we swallow some paracetamol it dissolved in stomach and most of it absorbed into the blood .The paracetamol then travels around the body and reach both the painful spot and our brain and then starts to reduce the feeling of pain .



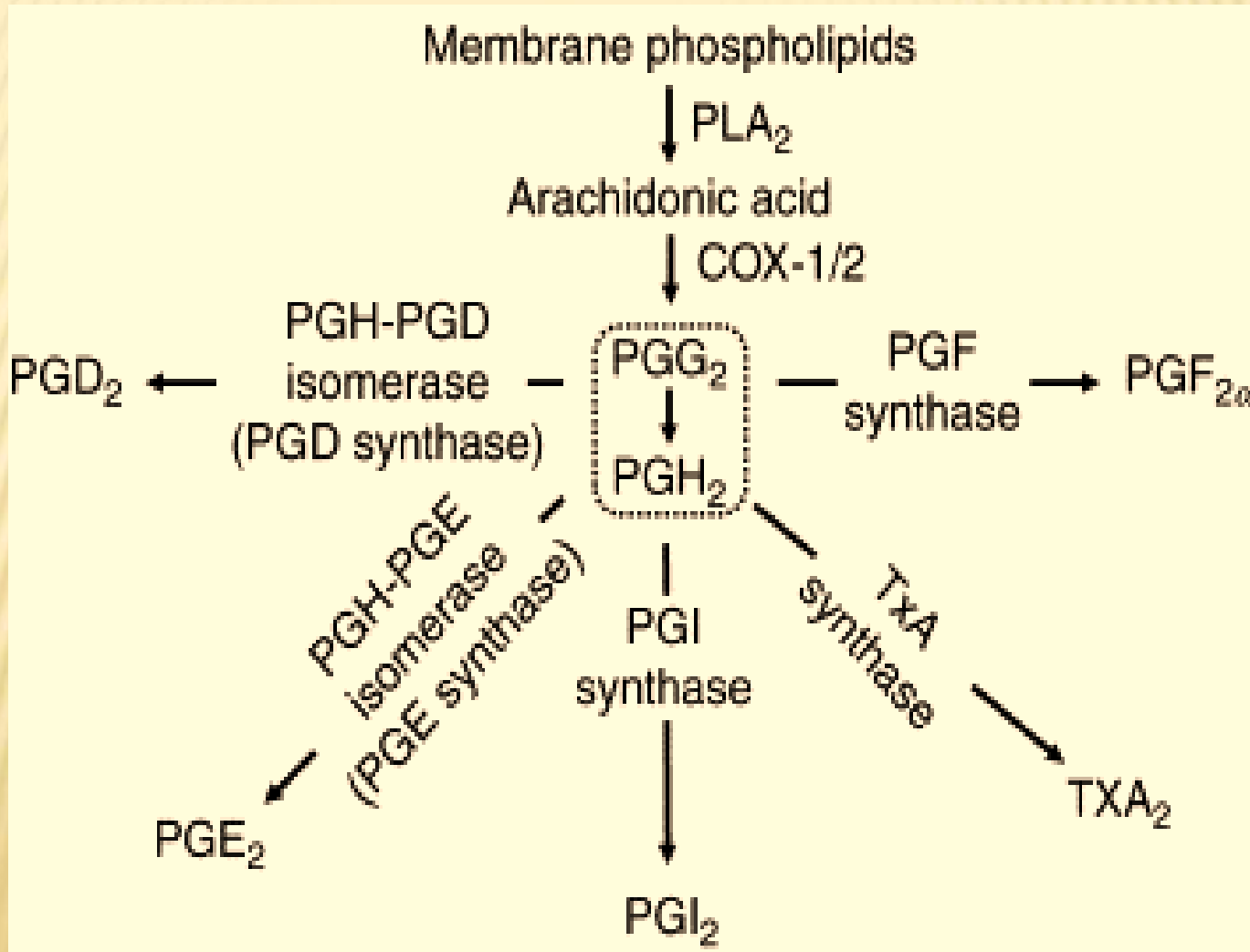
# SCHEMATIC DIAGRAM OF ABSORPTION OF PARACETAMOL



# MECHANISM OF ACTION [BIOLOGICAL WORK]

- ✘ Paracetamol inhibits prostaglandin synthesis by reducing the active form of cox-1 and cox-2 enzymes .
- ✘ This occurs only when the concentration of arachidonic acid and peroxide is low .
- ✘ Under these conditions , cox-2 is the predominant form of cyclooxygenase which explains the apparent cox-2 selectivity of paracetamol .

Cyclooxygenase (Cox) is an enzyme that catalyses the conversion of Arachidonic acid to prostaglandin(PGG & PGH) . These intermediaries are then converted to a variety of important PGH as well as Thromboxane A<sub>2</sub> (TXA<sub>2</sub>).





# ADVERSE EFFECTS

```
graph TD; A[ADVERSE EFFECTS] --- B[ASTHAMA]; A --- C[SKIN REACTION]; A --- D[CANCER]; A --- E[LIVER DAMAGE];
```

**ASTHAMA**

**SKIN  
REACTION**

**CANCER**

**LIVER  
DAMAGE**

THANK YOU